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are made to this science. Indeed, there is not a single department of anthropology that is not well represented in Washington. The Patent Office, the Census Bureau, the Board of Health, the Department of Agriculture, the Signal Office, the Indian Office are only a few of these. Further reference to some of these institutions and their operations will be made in future numbers of the NATURALIST.

## MICROSCOPY AND HISTOLOGY.[1]

METHODS OF INVESTIGATING ANIMAL CELLS.—Dr. Brass has devoted several years of close study to the structure and life of animal cells, and a detailed account of his methods appears in the first number of a new journal of microscopy.[2] The following are some of the more important of these methods:

1. *Protozoa.*—As most Protozoa move very rapidly when hungry, it is well to feed them before attempting to study them with the microscope. If well fed with powdered pieces of plants, &c., they usually remain quiet after a short time, and begin to assimilate the food-material which they have appropriated. In this condition of comparative quiet they can be easily examined with high powers. For this purpose they may be placed under a cover-glass with considerable water and a number of small green algæ to keep the water supplied with oxygen.

For higher powers Abbe's illuminating apparatus is extremely useful. In some cases it is desirable to have a completely one-sided illumination, and this is best effected by inserting beneath the illuminating apparatus a circular diaphragm-plate perforated with a slit $3^{mm}$ wide that runs parallel to the edge of the plate. It is best to have about $2^{mm}$ between the slit and the edge of the plate. Several diaphragm plates should be prepared in which the slit varies in extent from a half to a whole of a quadrant or more.

The following mixture, which is Meckel's fluid with the addition of a little acetic acid, is recommended above all other reagents as a preservative medium:

| | | |
|---|---|---|
| Chromic acid | 1 | part. |
| Platinum-chloride | 1 | " |
| Acetic acid | 1 | " |
| Water | 400–1000 | " |

Unicellular animals die very slowly in this mixture, and suffer very much less alteration in structure than when killed in osmic acid or picro-sulphuric acid.

A special method is required for Protozoa filled with opaque food-material. In many cases the nucleus and the structure of the cell-body are completely obscured by foreign bodies. The method adopted in such cases is as follows:

(1) Placed in picro-sulphuric acid 3–4 minutes.

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[1] Edited by Dr. C. O. WHITMAN, Mus. Comp. Zool., Cambridge, Mass.

[2] *Zeitschr. für wiss. Mikroskopie*, I, No. 1, pp. 39–51. 1884.

(2) Transferred to boiling hot water for a short time.

(3) Placed in water and a little ammonia added; this causes the contracted object to swell up to its original size and form.

(4) Neutralize the ammonia with a little acetic acid, and then

(5) Color with borax-carmine or ammonia-carmine.

(6) Wash and examine in dilute glycerine.

The picro-sulphuric acid destroys the nutritive material; the ammonia dissolves any particles of fat that may be present; and thus the object becomes transparent so far as possible.

A concentrated solution of corrosive sublimate may also be used with success for killing Protozoa; but care must be taken to wash thoroughly.

Dr. Brass has obtained his best results without reagents or dyes.

2. *The nature of Chromatin.*—Dr. Brass has advanced an entirely new theory in regard to the colorable portion of the nucleus. Hitherto it has been very generally supposed that the chromatin (Flemming) plays an important part in cell division, but Dr. Brass maintains that it represents simply surplus food-material. This opinion is supported by the fact that well-fed cells contain chromatin in abundance, while cells deprived of food for a considerable time appear to lose the chromatin.

PFITZER'S METHOD OF COLORING AND HARDENING AT THE SAME TIME.[1]—To a saturated aqueous solution of picric acid add a small quantity of an aqueous solution of nigrosin. This gives a deep olive-green mixture which kills very quickly and stains at the same time that it hardens. After a few hours' immersion the object may be transferred to water or alcohol for removing the acid and the nigrosin which remains in solution.

This method is very good for preparing small objects that have to be killed, hardened, stained &c., under the cover-glass.

FILTERING REAGENT BOTTLE.[2]—The usual forms of filters of paper and cotton are not as convenient as one could wish, and it was with a view to the production of a simple apparatus which would deliver, perfectly filtered, any quantity of a staining-fluid, or other reagent from a single drop to a dishful, that I devised, about two years ago, the bottle here described. A wide-mouth bottle of convenient size is fitted with a cork through which three glass-tubes are passed; one of which (Fig. 1, *a*) reaches nearly to the bottom of the bottle, while the other two tubes extend only just below the cork.

The long tube is curved above the cork, and at a point just beyond the curve there is attached to it a short piece of tubing (*b*) of twice the diameter of the first. The lower end of this larger tube (at *d*) is also fitted with a cork, through which passes a short piece of small tubing, which is slightly contracted at its distal end.

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[1] Ber. Dtsch. Botan. Gessellsch., 1, No. 1, p. 44, 1883.

[2] Devised by C. E. Hanaman.

Over the cork and open end of this short delivery tube, a piece of fine muslin (*d*) is stretched, and the space (*b*) in the large tube is filled with a loosely packed plug of absorbent cotton, forming an effectual filter. The second tube ends above the cork in a "thistle-bulb" funnel (*e*), the opening in which is formed into a neck of sufficient length to enable one to cork it securely. Through this thistle-top tube the reagent may be readily poured from a dish or other vessel. The third tube (*g*) is bent over the side of the bottle and a piece of rubber tubing is attached, which may end either in a short glass mouth-piece or atomizer-bulb, as the student may elect. In case the bulb is used it will be found necessary to loosen the cork in the funnel-tube (*e*) when a sufficient quantity of the contents has been expelled, in order to release the pressure and stop the flow.

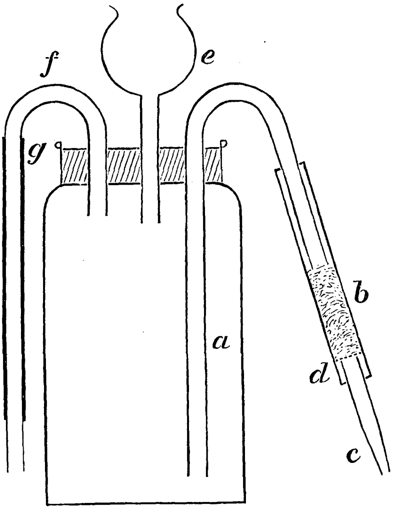

FIG. 1.—Filtering Wash-bottle.

This bottle differs from the one described at Montreal only in the use of the thistle-top tube and common bottle, in place of the more expensive three-neck or Wolfe's bottle. The thistle-top tubes may be purchased for about fifteen cents apiece, while the Wolfe's bottle would cost fifty cents or more.

Further, the thistle-funnel permits a solution to be readily poured into it from a dish, while the necks of the Wolfe's bottle are so small that the use of a funnel is necessary, except when the solution is poured from a spout or bottle-neck. Stains may thus be returned to the bottle and used over and over again, being perfectly filtered each time they pass through the plug of cotton. A gentle breath at the mouth-piece, or a slight compression of the bulb, expels a single drop, while by blowing steadily for a moment, or rapidly working the bulb, a dishful of the reagent is obtained.

When the plug of cotton becomes foul, which will not be for a long time, even with hematoxylin stain, it may be replaced by a fresh one by simply uncorking the lower end (*d*) of the large tube, pulling out the old plug with a pair of forceps and inserting a fresh one. The cotton should be but loosely packed to work easily. If the contracted end of the delivery tube becomes clogged through long disuse, it may be freed with a pin or fine wire, and the first dishful of the reagent returned to the bottle, when it will be found that the succeeding dishful will be perfectly filtered.—*From the Am. Mo. Mic. Jour. March, 1883.*

NOTES ON THE USE OF THE FREEZING MICROTOME.[1]—The tendency at the present time is to make all microscopic sections by the dry method after paraffin infiltration and imbedding; but no doubt there is a place, and an important one, for the freezing microtome in practical histology, and in this note I would like to call the attention of the readers of *Science Record* to what seem to me improvements in its use. Disliking greatly the disagreeable "muss" made by ice and salt, it occurred to me to take advantage of the device of plumbers to thaw out water and gas pipes, to use strong alcohol with the ice or snow instead of salt. By using snow or finely powered ice and ninety-five per cent alcohol, a temperature of twenty centigrades below zero is obtained within five minutes, and this temperature may be maintained with far less trouble than with ice and salt. The microtome used is the Rutherford pattern modified by placing the drain near the top instead of in the bottom. A rubber tube passing from this drain to a jar, preserves the overflow. It requires about 250 cc. of alcohol to freeze and keep frozen one tissue for cutting, but this is not lost, as little evaporation takes place and the dilution does no harm for many purposes, hence the method is not wasteful, while it is much more pleasant and expeditious than with salt.

Ordinarily tissues are infiltrated with thick gum before freezing, and then the sections are soaked in a relatively large amount of water to remove the gum. Evidently while soaking, staining and transferring the sections, especially if they be of such an organ as the lungs, there is every liability of their becoming folded or torn. This may be avoided by staining the tissue in the mass as for dry section cutting, and then soaking in water to remove any alcohol, and finally completely infiltrating the tissue in a thick solution of very clean gum arabic. When ready to make the sections the well of the microtome is filled with the thick gum and the tissue introduced at the proper time as usual. Before cutting the gum is cut away from the tissue, as in sharpening very bluntly a lead pencil, then as the sections are cut they are transferred directly to the slide. After several slides are filled, a drop of glycerine is added to each section and the cover-glass applied. This is practically mounting in Farrant's solution.

Instead of using gum arabic, Professor Sollas[2] recommends gelatine prepared as for glycerine jelly. This is used in every way as described for the thick gum, and the sections are placed upon the slide and covered with glycerine and the cover-glass applied. In this modification the sections are practically mounted in glycerine jelly. The cover-glass may be sealed in any approved way for either of the methods just described.—*S. H. Gage, Cornell University, March 1, 1884.*

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[1] From *Science Record*, No. 6, April, 1884.

[2] Professor J. Sollas. An improvement in the method of using the freezing microtome. *Quarterly Journal of Microscopical Science*, Jan., 1884, p. 163.